



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/815,140	03/31/2004	John Michael Snyder	MSFT-2926/306875.02	9191

41505 7590 12/22/2006
WOODCOCK WASHBURN LLP (MICROSOFT CORPORATION)
CIRA CENTRE, 12TH FLOOR
2929 ARCH STREET
PHILADELPHIA, PA 19104-2891

EXAMINER

REPKO, JASON MICHAEL

ART UNIT	PAPER NUMBER
----------	--------------

2628

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	12/22/2006	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No. 10/815,140	Applicant(s) SNYDER ET AL.	
	Examiner Jason M. Repko	Art Unit 2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-30 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 March 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f):
 a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Specification

1. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

2. Applicant is reminded that U.S. applications referred to by Attorney Docket number (MSFT-2901/306874.02 in paragraph [0002] of the disclosure) should be changed to U.S. Application numbers.

Drawings

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: 36' in Figure 1. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 101

4. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

5. **Claims 1-30 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.**

6. Claims 1-9 appear to be to an abstract idea rather than a practical application of the idea. The claimed invention does not result in a physical transformation nor does the claimed invention appear to provide a useful, concrete and tangible result. Claims 1-9 are directed to a process that does nothing more than solve a mathematical problem and manipulate abstract ideas.

7. Annex 5 of the “Interim Guidelines for Examination of Patent Application for Patent Subject Matter Eligibility” provides guidance with respect to the determination of the patentability of mathematical algorithms. If the “acts” of a claimed process manipulate only numbers, abstract concepts or ideas, or signals representing any of the foregoing, the acts are not being applied to appropriate subject matter. Benson, 409 U.S. at 71-72, 175 USPQ at 676. Thus, a process consisting solely of mathematical operations, i.e., converting one set of number into another set of numbers does not manipulate appropriate subject matter and thus cannot constitute a statutory process.

8. Claims 1-9 are directed to a process consisting solely of operations manipulating a set of mathematical entities. It fails to use the result of representing high and low frequency lighting to enable its functionality to be realized. Additionally, the asserted practical application in the specification of the method is displaying a computer-generated image on a display device. The practical application is not recited in the claims nor does it flow inherently therefrom. Therefore, claims 1-9 are directed to non-statutory subject matter.

9. Claims 10-18 and 28-30 appear to encompass a computer program not technologically embodied to enable the functionality to be realized. Claims 10-18 are directed to a “system” and claims 28-30 are directed to “hardware control device.” However, paragraph 18 of the descriptive portion of the specification appears to indicate that the “system” and “device” in the aforementioned claims encompass computer programs:

On the contrary, as used herein the term "computer system" is intended to encompass any and all devices capable of storing and processing information and/or capable of using the stored information to control the behavior or execution of the device itself, regardless of whether such devices are electronic, mechanical, logical, or virtual in nature.

The “hardware control device” appears to claim virtual devices that control the behavior of hardware, as opposed to a device that is hardware. Computer programs, *per se*, are not in one of the statutory categories of invention. Functional descriptive material claimed in combination with an appropriate computer readable medium to enable the functionality to be realized is patent eligible subject matter if it is capable of producing a useful, concrete and tangible result when used in the computer system. See MPEP § 2106 with regard to computer programs.

7. Claims 19-27 recite a computer-readable medium comprising computer readable instructions. However, the recitation of “computer-readable instructions” does not exclude non-functional descriptive material encoded on a computer readable medium, which is non-statutory. In contrast, a claimed computer-readable medium storing a computer program is a computer element which defines structural and function interrelationships between the computer program

Art Unit: 2628

and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory.

10. To expedite a complete examination of the instant application, the claims rejected under 35 U.S.C. 101 as non-statutory subject matter are further rejected as set forth below in anticipation of applicant amending the claims to place them within the four categories of invention.

Claim Rejections - 35 USC § 112

11. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

12. Claims 7-9 and 25-27 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

13. The claims recite the phrase (emphasis added) "said element of prioritizing each of the plurality of regions for subsequent extraction and approximation with point light sources comprises is based on...." For the purpose of the prior art rejection that follows, "comprises is based on" is interpreted as "comprises."

Claim Rejections - 35 USC § 103

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2628

15. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

16. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

17. **Claims 1-3, 5, 10-12, 14, 19-21, 23, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Peter-Pike Sloan, Jan Kautz, John Snyder, "Precomputed Radiance Transfer for Real-Time Rendering in Dynamic, Low-Frequency Lighting Environments," July 2002, ACM Transactions on Graphics, Vol. 21, No. 3, p. 527-536 (Sloan et al) in view of Cass Everitt, Mark J. Kilgard, "Practical and Robust Stenciled Shadow Volumes for Hardware-Accelerated Rendering," March 12, 2002, Technical Report, NVIDIA Cooperation, Published online at developer.nvidia.com (Everitt et al).**

18. With regard to claims 1, 2, 3 and 5, Sloan et al discloses, radiance accumulation derived from a real-time technique wherein a set of low frequencies of lighting are represented with a

Art Unit: 2628

tabulated rendering method [as recited in **claim 1**], wherein a set of low frequencies of lighter are represented with a precomputed radiance transfer (PRT) technique [as recited in **claim 2**]

(Figure 2; 1st paragraph of section 10: "Precomputed radiance self-transfer is a general method for capturing the occlusion and scattering effects an object has on itself with respect to any low-frequency lighting environment. When the actual incident lighting is substituted at run-time, the resulting model provides global illumination effects like soft shadows, interreflections, and

caustics in real-time.") and rendered using a spherical harmonics technique [as recited in **claim**

3] (1st paragraph of section 5: "As a preprocess, we perform a global illumination simulation over an object *O* using the SH [spherical harmonic] basis over the infinite sphere as emitters.").

However, Sloan et al does not disclose high-frequency energy approximated with an on-the-fly method. Everitt et al discloses radiance accumulation derived from a real-time technique wherein high-frequency energy is approximated with an on-the-fly method wherein a set of high frequencies of lighting is rendered using shadow volume technique as recited in claims 1 and 5 (Section 3.3 provides the rendering procedure based on shadow volumes; Figures 2 and 3 show images depicting high frequency lighting approximated using shadow volumes).

19. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the teachings of Sloan et al with the teachings of Everitt et al to obtain the advantage of not only handling low frequencies of lighting but also high frequencies to generate real-time. Sloan et al teaches the low-frequency lighting can be represented with few coefficients (Sloan et al, paragraph 6, section 1), as compared to high-frequency lighting. Thus, one of ordinary skill in the art would be motivated to approximate high-frequency lighting according to the method taught by Everitt et al to efficiently use computational resources. Therefore, it would

Art Unit: 2628

have been obvious to combine Sloan et al with Everitt et al to obtain the invention specified in claims 1-3 and 5.

20. Claims 10-12 and 14 recite limitations similar in scope to those of claims 1-3 and 5, respectively, as a system. Claim 28 recites limitations similar in scope to those of claim 1, respectively, as a device. Sloan et al discloses a system executing the disclosed method in the fifth paragraph of section 6.2. It would have been obvious to implement the combination of teachings disclosed by Sloan et al and Everitt et al on a system to enable the method to be used in games and applications.

21. Claims 19-21 and 23 recite limitations similar in scope to those of claims 1-3 and 5, respectively, as a computer-readable medium. Sloan et al discloses a system executing the disclosed method in the fifth paragraph of section 6.2. Sloan et al does not expressly disclose a computer-readable medium containing instructions; however, this feature is deemed inherent to the system disclosed in section 6.2 as one of ordinary skill in the art would have recognized that they system would have been unable to produce the results had the instructions for carrying out the method not been stored by a computer readable medium. It would have been obvious to implement the combination of teachings disclosed by Sloan et al and Everitt et al on a computer readable medium to enable the method to be used in games and applications.

22. **Claims 1, 4, 10, 13, 19, 22 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Peter-Pike Sloan, Jan Kautz, John Snyder, "Precomputed Radiance Transfer for Real-Time Rendering in Dynamic, Low-Frequency Lighting Environments," July 2002, ACM Transactions on Graphics, Vol. 21, No. 3, p. 527-536 (Sloan et al) in view of U.S. Patent No. 6,664,962 to Komsthoeft et al.**

23. With regard to claims 1 and 4, Sloan et al discloses, radiance accumulation derived from a real-time technique wherein a set of low frequencies of lighting are represented with a tabulated rendering method [as recited in **claim 1**], wherein a set of low frequencies of lighter are represented with a precomputed radiance transfer (PRT) technique [as recited in **claim 2**] (*Figure 2; 1st paragraph of section 10: "Precomputed radiance self-transfer is a general method for capturing the occlusion and scattering effects an object has on itself with respect to any low-frequency lighting environment. When the actual incident lighting is substituted at run-time, the resulting model provides global illumination effects like soft shadows, interreflections, and caustics in real-time."*) and rendered using a spherical harmonics technique [as recited in **claim 3**] (*1st paragraph of section 5: "As a preprocess, we perform a global illumination simulation over an object O using the SH [spherical harmonic] basis over the infinite sphere as emitters."*). However, Sloan et al does not disclose high-frequency energy approximated with an on-the-fly method. Komsthoeft et al discloses radiance accumulation derived from a real-time technique wherein high-frequency energy is approximated with an on-the-fly method wherein a set of high frequencies of lighting is rendered using shadow mapping technique as recited in claims 1 and 5 (*line 67 of column 9 through line 5 of column 9: "Because the light intensity is attenuated (e.g., linearly) with distance, the resulting brightness value at a rendered surface can be used as an indication of the distance from the light to the surface. This computed depth value can be compared with a shadow map depth value to determine whether or not to shadow a pixel."*; *Figure 15 shows high frequency lighting; Figure 7 shows an on-the-fly shadow mapping procedure*).

Art Unit: 2628

24. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the teachings of Sloan et al with the teachings of Komsthoeft et al to obtain the advantage of not only handling low frequencies of lighting but also high frequencies to generate real-time. Sloan et al teaches the low-frequency lighting can be represented with few coefficients (*Sloan et al, paragraph 6, section 1*), as compared to high-frequency lighting. Thus, one of ordinary skill in the art would be motivated to represent high-frequency lighting according to the method taught by Komsthoeft et al to efficiently use computational resources. Therefore, it would have been obvious to combine Sloan et al with Komsthoeft et al to obtain the invention specified in claims 1 and 4.

25. Claims 10 and 13 recite limitations similar in scope to those of claims 1 and 4, respectively, as a system. Claim 28 recites limitations similar in scope to those of claim 1, respectively, as a device. Sloan et al discloses a system executing the disclosed method in the fifth paragraph of section 6.2, and Komsthoeft et al discloses a system in Figures 1 and 2. It would have been obvious to implement the combination of teachings disclosed by Sloan et al and Komsthoeft et al on a system to enable the method to be used in games and applications.

26. Claims 19 and 22 recite limitations similar in scope to those of claims 1 and 4, respectively, as a computer-readable medium. Sloan et al discloses a system executing the disclosed method in the fifth paragraph of section 6.2. Sloan et al does not expressly disclose a computer-readable medium containing instructions; however, this feature is deemed inherent to the system disclosed in section 6.2 as one of ordinary skill in the art would have recognized that they system would have been unable to produce the results had the instructions for carrying out the method not been stored by a computer readable medium. It would have been obvious to

Art Unit: 2628

implement the combination of teachings disclosed by Sloan et al and Komsthoeft et al on a computer readable medium to enable the method to be used in games and applications.

27. Claims 6, 9, 15, 18, 24, 27, 29 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Peter-Pike Sloan, Jan Kautz, John Snyder, "Precomputed Radiance Transfer for Real-Time Rendering in Dynamic, Low-Frequency Lighting Environments," July 2002, ACM Transactions on Graphics, Vol. 21, No. 3, p. 527-536 (Sloan et al) in view of Cass Everitt, Mark J. Kilgard, "Practical and Robust Stenciled Shadow Volumes for Hardware-Accelerated Rendering," March 12, 2002, Technical Report, NVIDIA Cooperation, Published online at developer.nvidia.com (Everitt et al) in view of Sameer Agarwal, Ravi Ramamoorthi, Serge Belongie, and Henrik Wann Jensen, "Structured Importance Sampling of Environment Maps," July 2003, ACM Transactions on Graphics, Vol. 22, No. 3, p. 605-612 (Agarwal et al).

28. With regard to claim 6, the combination of Sloan et al and Everitt et al disclose the limitations of parent claim 1; however, Sloan et al and Everitt et al do not disclose segmenting, prioritizing, and allocating as recited in claim 6. Agarwal et al discloses "segmenting a lighting environment into a plurality of regions (*see Figure 3; 5th paragraph of section 3.2: "Figure 3 illustrates our algorithm and compares the stratification obtained by using our proposed importance metric with illumination and area based importance."*); prioritizing each of the plurality of regions for subsequent extraction and approximation with a plurality of small analytic light sources (*Section 2.2 discusses an importance metric; 1st paragraph of section 2.2: "A major consequence of our analysis and empirical results is that visibility coherence is significant only for small light sources, and consequently the main impact of our metric is to*

Art Unit: 2628

reduce the number of samples for these lights while using an essentially illumination-based metric in other regions."; 4th paragraph of section 4: *"The first optimization is pre-integrating the illumination within each stratum effectively combining all the pixels in the stratum into a single directional light source located at the center."*); and allocating one or more point samples to each of said plurality of regions" (4th paragraph of section 3.1: *"To assign samples, we first compute our metric for the entire map as: ..."*; 5th paragraph of section 3.1: *"Once the samples have been assigned to the components corresponding to t_{d-1} , we proceed to the next threshold level t_{d-2} ."*).

29. With regard to claim 9, Agarwal et al discloses "prioritizing each of the plurality of regions for subsequent extraction and approximation with point light sources is based on a contrast technique" ("*Sorting*" in section 4: *"For this purpose, we use a variant of Ward's adaptive shadow testing method [Ward 1991] which samples all the lights deterministically in order of contribution until the contrast that the remaining lights can add is below a certain threshold."*).

30. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate the teachings of Agarwal et al in the invention disclosed by the combination of Sloan et al and Everitt et al. The motivation for doing so would have been to "sample both visibility and illumination efficiently" as suggested by Agarwal et al paragraph 4 of section 1. Therefore, it would have been obvious to combine Agarwal et al with Sloan et al and Everitt et al to obtain the invention specified in claims 6 and 9.

31. Claims 15 and 18 recite limitations similar in scope to those of claims 6 and 9, respectively, as a system. Claims 29 and 30 recite limitations similar in scope to those of claim 6

Art Unit: 2628

and 9, respectively, as a device. Sloan et al discloses a system executing the disclosed method in the fifth paragraph of section 6.2. It would have been obvious to implement the combination of teachings disclosed by Sloan et al and Everitt et al on a system to enable the method to be used in games and applications.

32. Claims 24 and 27 recite limitations similar in scope to those of claims 6 and 9, respectively, as a computer-readable medium. Sloan et al discloses a system executing the disclosed method in the fifth paragraph of section 6.2. Sloan et al does not expressly disclose a computer-readable medium containing instructions; however, this feature is deemed inherent to the system disclosed in section 6.2 as one of ordinary skill in the art would have recognized that they system would have been unable to produce the results had the instructions for carrying out the method not been stored by a computer readable medium. It would have been obvious to implement the combination of teachings disclosed by Sloan et al and Everitt et al on a computer readable medium to enable the method to be used in games and applications.

Additional Remarks

33. Claims 7, 8, 16, 17, 25 and 26 are rejected under 35 USC 101; however, these claims contain subject matter not found in the prior art.

34. With regard to claims 7, 16 and 25, Agarwal discloses “prioritizing each of the plurality of regions for subsequent extraction and approximation with a plurality of small analytic light sources” but does not disclose or suggest “prioritizing each of the plurality of regions for subsequent extraction and approximation with point light sources comprises is based on high frequency energy reduction.” With regard to claims 8, 17 and 26, Agarwal discloses “prioritizing each of the plurality of regions for subsequent extraction and approximation with a plurality of

Art Unit: 2628

small analytic light sources” but does not disclose or suggest “said element of prioritizing each of the plurality of regions for subsequent extraction and approximation with point light sources comprises is based on an iterative algorithm for a background estimation.”

Conclusion

35. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Yoshinori Dobashi, Kazufumi Kaneda, Hideki Nakatani, Hideo Yamashita Hiroshima, Tomoyuki Nishita, “A Quick Rendering Method Using Basis Functions for Interactive Lighting Design,” August 1995, Computer Graphics Forum, Vol. 14, No. 3, p. 229-240 discloses relighting a scene using a spherical harmonic technique. Ren Ng, Ravi Ramamoorthi, Pat Hanrahan, “All-Frequency Shadows Using Non-Linear Wavelet Lighting Approximation,” July 2003, ACM Transactions on Graphics, Vol. 22, No. 3, p. 376-381 discloses all-frequency shadows for geometry and image relighting. Ravi Ramamoorthi, Pat Hanrahan, “Frequency Space Environment Map Rendering,” July 2002, ACM Transactions on Graphics, Vol. 21, No. 3, p. 517-526 discloses rendering with spherical harmonic reflection maps. U.S. Patent Application Publication Nos. 2005/0041023 and 2005/0041024 to Robin Greene et al disclose a real-time method for spherical harmonic lighting. U.S. Patent No. 6,778,189 discloses a shadow volume technique.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason M. Repko whose telephone number is 571-272-8624. The examiner can normally be reached on Monday through Friday 8:30 am -5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached on 571-272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JMR


ULKA CHAUHAN
SUPERVISORY PATENT EXAMINER